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JAPAN REPORT

No. 165

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ECONOMIC

LEASE INDUSTRY'S PRESENT STATUS REVIEWED

New Development, Future

Tokyo TOKI NO KEIZAI in Japanese Sep 82 pp 107-111

[Text] The leasing industry, which appeared to have lost its momentum from the oil shock, seems to have gotten back on the growth track. Last year's leasing contracts reached 1.5454 trillion yen, an increase of 23.6 percent over the previous year. This is quite a significant event in view of the extended industrial recession and when only a 7.7 percent gain was seen in FY 1980. There was another instance in 1976 when it experienced a drop to a single digit gain and later recovered to a double digit gain, but the impetus of the recent double digit growth is different. It seems to have a greater sustaining power this time.

Nevertheless, Japan's leasing industry has been in existence for about 20 years since it started and the progress made during that time has been phenomenal. The lease contracts in FY 1964 issued by the Japan Lease, Oriental Lease and Tokyo Lease amounted to only 4 billion yen, which means an increase of 400 times over the last 18 years.

One of the reasons for this growth was the brisk investment in facilities made by these firms. The private sector's investment in facilities, in particular, has increased on an annual rate of 17.3 percent from 4.6 trillion yen in FY 1963, to 22.8 trillion yen in FY 1973 due to technological innovations and rapid introduction of new machines and facilities during the 10 years after the lease industry started.

A strong growth was seen especially in the tertiary industry since the mid-seventies and a new term called "economic service" was born. The rate of facility investment by the tertiary industry grew from 34 percent in the mid-sixties to 45 percent in mid-seventies. The facility investment by the leasing companies was only 5.0 percent in FY 1965 but gained conspicuously to 11.2 percent in FY 1981. It is now claimed that the leasing industry occupies over 10 percent of the private sector facility investment. A noteworthy point is that the majority of the service oriented facility investment is estimated to be made by the lease industry. It can be said that the lease industry benefitted from riding the crest of the economic services.

The 2nd reason for the growth of the leasing business is the wide acceptance of the benefit of "procuring 100 percent unsecured funds and being more economical when dealing with a rapidly depreciating item." Since the users can apply the lease fee as a loss, there are many cases where leasing is advantageous when the legal life of equipment is longer than the actual life and the users can benefit from "low interest rate." Over 60 percent of the lease contracts involve smaller enterprises. These users have confidence in major companies since many of them are subsidiaries of major financial and large corporations. Moreover, the users are able to utilize relatively low interest funds through a leasing company.

In addition, a lease company can obtain higher profits by accepting part of the depreciation and retrenchment of the users; therefore, it is possible to accept higher risk users. The leasing company becomes an important source of funds for high risk companies: Enterprises such as a supermarket in constant need of funds and willing to pay higher interest, and smaller enterprises which cannot secure loans through a normal financial source because of lack of credit rating.

The third reason for the growth is that the various government aid measures for modernization of smaller enterprises have provided good benefits for the leasing companies.

Various financing systems beginning in 1967 with the "voluntary chain lease system" to promote modernized distribution in 1970, "People's livelihood equipment lease system" and in 1972 the "lease financing measure for propagation and promotion of new machines and equipment" were implemented to stimulate demand. It is estimated that the lease demand for systems increased to approximately 20 percent of the total leasing business between 1970 and 1973. In 1973, a "lease credit insurance" was established to have the government guarantee 1/2 of the loss in the event a user of any of the 29 items considered necessary for modernization of smaller enterprises went bankrupt and the lease payment became uncollectible. This encouraged the lease companies to deal with operationally less stable smaller companies more energetically.

Technological Advancement, Personnel Reduction

The lease industry's second stage of growth came from the full manifestation of such leasing features to create a manageable situation. The stagnate economy continued and certain enterprises have become "aggressive" for fear of a gradual decline. On one hand, a severe business environment calls for greater productivity in order to survive. To achieve this, office automation equipment and robots have become necessary. These are suitable leasing items.

Industrial machines for greater productivity were the main items leased during the high growth period and the computers and office equipment have taken over since the oil shock. The industrial machines which occupied 40.8 percent of the entire leasing business in 1970 dropped to 25.2 percent in 1980, whereas, office equipment gained from 28.5 percent to 35.2 percent. The recent sold-out situation of the computer manufacturers is tied in with the higher demands for leasing.

A rapid technological advancement is creating early obsolescence of OA equipment starting with computers, office computers, facsimiles and word processors. This also applies to various measuring devices in line with the technological advancement of new materials and mechanization. In effect, the importance of compatible lease items in relation to the entire facility investment has increased at a rapid pace.

Recently, medical equipment has shown rapid growth. With the growth of health consciousness, progress in people's health and the aging of society, the medical care industry is expected to grow even more, with the exception of equipment such as the supersonic diagnostic device, which has already fulfilled the demand, are not too promising. However, from an intermediate range, an annual growth of nearly 20 percent can be expected. Nuclear medical devices are potential candidates for leasing, and when the laser scalpel being developed becomes practical, the boom in its use will create a sure demand.

Business equipement is not expected to expand as much as in the past because of the decrease in large items as reflected by the large scale retail store law. The information equipment such as POS (selling time information control) and the facility investment by medium-size supermarkets are likely to grow. Stable demands will come from supermarkets for their expansion and replacement of facilities such as refrigerated showcases, etc.

Smaller enterprises are expected to occupy greater weight in the leasing volume. The NC machine tools are being used by miniplants for improved productivity and quality in order to cope with the skyrocketing personnel expenses. Copies are infiltrating the boutiques and convenience stores. The introduction of electronic scales is growing in private stores and shops. This trend aimed toward energy conservation, reationalization and improved service will probably continue. In addition to these factors, the existence of many smaller and minute enterprises, which do not qualify for loans from the existing financial organs, is one of the reasons for the growing demands.

In contrast, the demands of the government agencies and organizations are expected to drop. The ratio of government agencies and organizations in the intire leasing system remained low at 1.2-2.0 percent in the past 20 years and the future is not too promising either. This may be due to the restriction placed by the single fiscal year budget system but the investment slowdown is unavoidable due to financial difficulty and administrative reorganization.

The demand forecast for the lease industry in FY 1990 is expected to reach 4.85 trillion yen in commodities and services. The growth will be slower when compared with the phenomenal gain of over three times in FY 1981, but it seems that a large growth potential is still there. The facility investment is likely to increase by 4.62 percent in FY 1985 and 5.55 percent in FY 1990.

Move Toward Comprehensive Financing

The high growth of the lease industry was definitely a result of "timeliness" but the efforts of the industry should not be overlooked. With the growth of lease companies, the needs of the users became more diversified, and in order to meet these needs, an innovative leasing system developed. At the outset, the system most used was the finance lease system whereby the leasing companies purchased items needed by the users and rented them under contract.

However, with the growth of leasing, users started requesting maintenance and management of leased items and for consultation on the selection of equipment and market research. This trend was spurred on by the increasing contracts by the smaller enterprises.

Accordingly the lease companies developed a maintenance lease system and a consulting system to provide information or guidance on equipment and machines by training specialists on specific equipment, etc., and a rental system backed by services such as installment payments.

Presently, certain lease companies are using the installment lease plan to consolidate the building, beds, clinical equipment, etc., of a hospital. An automobile lease includes regular maintenance and accident processing along with the purchase, registration and insurance procedures. Large auto lease companies even have their own garages for maintenance and other services services.

There are many forms of comprehensive financing in the growing leasing functions. Up to now, the industry centered on Japan Lease, Mitsui Lease Enterprise, Fuyo General Lease and Orient Lease who are engaged in comprehensive installment financing and others such as Tokyo Lease, Diamond Lease, Showa Lease, Century Leasing System and Sumisho Lease with 80 percent of the leasing business specialize strictly in leasing.

However, the recent move is toward an installment and other financing systems by both comprehensive financing types and lease specialty types. This is because the large lease negotiations for aircraft and ships, which have grown rapidly in the last year or two, are being classified not as leasing but as installment and other forms of financing, and also by an increasing move toward comprehensive financing by specialized industries.

The companies, which have been using installment plans and others, and specialized industries have taken over 30 percent of the share in the installment and other plans.

Among them, Tokyo Lease reversed the lease contract of 78,225,000,000 yen and installment and other types for 3.39 billion yen in the first 3 month period of 1981 to leasing of 86,195,000,000 yen and installment and others for 92,464,000,000 yen in the same period of 1982. Diamond Lease also increased the share of installment and other plans from 14 percent in the first 3 month period of 1981 to 31 percent in 1982 and Showa Lease increased from 24 percent to 37 percent. The amount of increase for leasing was 20.9 billion yen but the installment and others including 1.5 billion yen for aircraft gained by 31.2 billion yen. Sumisho showed an increase from 25 percent to

43 percent and the Century Leasing System gained from 9 percent to 17 percent although low in component ratio.

The large Orient Lease showed a greater share in the installment and other plans through expansion of complete financing of housing (both construction and purchase). Although the aircraft section cannot be treated equally, various companies have gone more into financing.

The drawback is that the profit from comprehensive financing is not as great in relation to the amount of sales. This is because of the fierce competition, not only in lease negotiations, but also in finance service and aircraft lease talks. The industry views even more that the "future is cloudy" regarding the long-range trend toward comprehensive financing.

Individual Users and Foreign Market

The future topic of the lease industry is probably on the cultivation of individual users and promotion of an international market. The individual users up to now were mostly doctors for medical equipment. It is viewed that the demands for cosmetics and decorative items will grow although it will be restricted from the standpoint of income to a certain social stratum. The trend is already seen in hospitals but larger systematized items such as building construction and land compensations are expected to increase.

An expansion toward the foreign market is expected from here on. Internationalization of the lease industry started in the fall of 1971 in Southeast Asia and Central and South Americas, but the scale, with the exception of two major companies, is still in the single digit range.

There are two ways of internationalizing the lease industry. First is the multination leasing, such as in the case of international airlines, to reduce the foreign currencies. Another way is to establish a leasing firm abroad.

A typical example of the former method is the "yen-based U.S. type leverage lease" totalling 30.6 billion yen by Japan Lease and Tokyo Lease through the cooperation of the Bank of New York. The tax incentive measure of leasing in the United States and the interest differential benefit of Japan and the United States and France are applied here. This has drawn international interest as a new facility procurement method of the European countries afflicted with high interest rates.

However, there is a problem of "country risks" in multination leasing. Items other than aircraft and ships are not too promising because of the problems of fluctuating exchange rates on profits and the conditions for independent management and operation by users have not been resolved yet.

Since there are many leasing opportunities through which to avoid international trade frictions and to promote international economic cooperations, the growth possibility is great depending on the government's policies and industries' efforts.

In regard to the latter--establishment of leasing firms abroad--ther are many positive achievements, but these are limited to certain major firms. Political, economic and legal problems exist in the overseas ventures, but because of the maturing capitalism and industrialization of many developing countries, an environment suited for leasing is evolving.

How to extract personal demands and strengthen internationalization depends on industry's planning. Leasing demands must be dealt with promptly through marketing. The lease industry is still very weak in this field.

The Lease Enterprises Society's research on the "first organ being consulted by enterprises on facility investment" shows that manufacturers and dealers lead overwhelmingly by 44.3 percent, followed by banks with 23.3 percent, lease companies with 13.3 percent, certified public accountants, licensed tax consultants and small business analyzers with 11.3 percent and management consultants with 2.1 percent. Leasing companies affiliated with manufacturers and banks and those having operational ties with manufacturers and dealers have relative advantages. Other leasing companies have less influence but the lack of information has something to do with it also. In order to establish greater independence, the leasing companies must come up with a reinforcement policy.

A plan for more complete funds procurement is necessary. Leaders of lease companies have expressed unanimously that, "For qualitative competition expected in the future, an acquisition of low cost funds will be the focal point." The slowdown following the oil shock was due to stagnant facility investment but the restricted funds procurement was also responsible. In a certain way, the lease industry is dependent on financing. It is certain, nonetheless, that operational planning goes hand-in-hand with funds procurement. Although we are now in a period of monetary easing, the key to growth still depends on the ready acquisition of low cost funds at home and abroad.

The major companies are now using diverse form of funds procurement such as through corporate debentures and foreign bonds. At this time, Orient Lease is the only company with listed stocks and there is a possibility that it will switch from the direct financing to indirect financing in the future.

Many leasing companies depend on banks for funds. But only a small amount of prime rate financing is used by smaller companies because of the difficulty in obtaining even semiprime rate financing from their affiliated banks. If, for example, a leasing company borrows at a higher rate than the user, the "interest reduction effect from a creditability difference" cannot be expected and may even lead to a loss of a function as a leasing company.

Fatalistic Over Competition

One other topic of discussion is the prevention of excessive competition. To begin with, the lease industry is structurally competitive. The independent lease companies and those related to banks, business firms and manufacturers, and outsiders and insiders, and large and small are carrying on operational

strategies with varied personnel and management creating advantageous and disadvantageous confrontations. Moreover, new ones are on the increase in order to get on the growth bandwagon.

Therefore, a need for an industrial conciliation has been sought and some efforts have been made by the lease industrial society and others. However, due to many outsiders with varying ideas and interests, very little has been accomplished. It only led to frequent overbidding and fee "dumping" which resulted in lower real earning rate of less than 5 percent compared with 12-13 percent on 1973.

Moreover, bad debts increased due to hasty loans from intensified competition and the deferrment of funds and the loss of earning power cannot be overlooked. Since the lease industry in certain cases is tied in with marginal finance, a lax credit check can lead to the danger of irrecoverable debts. A large bad debt will create a "small profit and large sale" situation and the hard earned profit will dissipate.

However, it cannot be denied that the fierce competition has eased the investigation to provide easier credit. Yet, there are cases of growing discouragement due to strict investigations and supervision including the frontline management by bankers.

In the case of smaller and new firms, the underlying tone is that they "cannot expand by following the 'theory of the powerful' of the major companies." They cannot follow the "sound judgement" nor possess the force and leadership of the major companies. Self-discipline by the entire lease industry can lead to a violation of the Antimonopoly Act. A move toward self-discipline of excessive competition is seen among the major companies. The spotlighted aircraft leasing with the rock bottom profit margin of 9 percent was taken up together by the major companies and they are looking toward a more appropriate leasing rate, except they are still far from being a cooperative structure as a whole.

Despite these problems, the lease industry is one of the new growth industries in our low growth economy. Moreover, there is a possibility of offering super large items including plants if the investment incentive tax system of the United States can be introduced, considering that the owners and users need not be the same to maintain growth. If this takes place, the lease industry will grow beyond anticipation and the users will be centered on large enterprises.

International Markets Development

Tokyo TOKI NO KEIZAI in Japanese Sep 82 pp 116-118

[Text] Third Peak

Internationalization of the lease industry which has been discussed for many years is about to become a full-scale reality. A look at the progress made by the lease industry from the internationalization viewpoint shows that up

to now it has twice before reached a peak. The first peak was between 1971 and 1973 and the second from 1979 to 1980. The first peak took place during a period when all the domestic producers made a move toward the international market. The 10 biggest economic news items of that period reported were: the cases involving the dollar shock and yen fluctuation system; Japanese-U.S. governmental agreement on textiles; China's acceptance to the United Nations in 1971; normalization of diplomatic relations between Japan and China; new yen policy; the enforcement of the trade control law in 1972; Middle East war and oil crisis; adoption of Tokyo proclamation of GATT; and lifting restrictions on calculators and IC's in 1973 which stimulated internationalization of our economy and industry. The lease industry has not been left out and the so-called pioneer lease companies have already internationalized. However, the overseas advancement in short was "limited" to "Hong Kong." These lease companies, to this day, do not have a clearcut vision and strategy toward internationalization because they aimed toward Southeast Asia and Hong Kong as their future lease markets.

The second peak was in 1979-80 when the lease companies, which had established a sound basis domestically, moved toward internationalization for structural improvement and expansion. The aircraft lease of 1978 had a great effect on the move. The aircraft lease itself was enforced through a special financing by the Export-Import Bank of Japan through the support of the Ministry of International Trade and Industry as a link toward reduction of a large favorable balance of trade which became a great international issue. It is a so-called "government initiated project," but its significance has been great. The lease companies which gained confidence in overseas leasing changed their posture toward foreign markets and moved rapidly toward establishment of their overseas bases.

Japan Lease and Orient Lease were the two companies which took the lead in internationalization. Japan Lease looked to the future of overseas advancement by saying, "With the internationalization of the Japanese economy and its increasing role in the world economy, a demand for an internationalization of our country's lease industry will grow internally and externally," and as a way to establish a diversed operational base, an effort was made for improved international management. The first investment was in the establishment of overseas bases and operational know-how. Orient Lease also is promoting positively as to the establishment of bases and has acquired 15 percent of the expenditures from the World Bank to establish a joint company in Sri Lanka in 1980; this is noted as a new route for funds procurement of the lease companies.

Background of Internationalization

Internationalization comes with the passing of time but what is behind the highlighted international business of the lease industry? Japan Lease gives the following regarding this:

1. Through intensified competition among the lease companies in Japan, profits decreased which made it necessary to expand the contract amount even more to attain profits equivalent to those of the past. However, expansion

was not easy due to increasing new participants and to domestic competition. Large lease companies started thinking of overseas markets.

2. Japanese business advancement into foreign markets has increased lately and included among them are some customers of the lease companies. These overseas customers also need to lease items which the lease companies can fulfill.

3. There is an increasing number of lease companies in developing countries who are seeking know-how and capital from the Japanese lease companies.

4. Across the border lease transactions between foreign countries have increased. It is more advantageous to establish at-site corporations to collect information and participate in the transactions.

5. In view of the great difference in the rate of interest between yen and dollar lately, some overseas enterprises have chosen the use of yen and some have diversified their obligations into both dollar-base and yen-base obligations. However, only certain enterprises are qualified to receive overseas financing from banks according to the regulation of the Ministry of Finance; therefore, lease companies have taken the place of a bank to provide a lease or a yen-base installment sale.

Enthusiasm toward overseas advancement differs according to the structure and strategy of a company. In general, many companies which specialize in leasing take a very cautious attitude whereas the pioneer group aiming for comprehensive financing is strongly in favor of internationalization. From a long-range view, however, practically all agree that "a positive posture must be taken." A statement "Business has no boundaries" by President Yoshihiko Miyauchi of Orient Lease represents this thinking.

The present targets of various companies are centered in Hong Kong and Singapore in Southeast Asia and South Americas. Each company is expediting the preparation of operational networks in these markets. Many lease companies have taken the policy of "priority system rather than the across-the-board system" (Tokyo Lease) because the lease industry "will not survive in a market where capitalism has not reached maturity" (Takenobu Inada, director of Lease Business Society) and because of competition from the U.S. lease companies. Some say that "certain developing countries have no base for leasing business" (Sogo Lease) as symbolized by the Chinese market. It was hoped that China would provide a most promising lease market with their rush into modernization and Japan's pursuit of new lease markets, but the fever has subsided completely. China's reconsideration of modernization may be the factor but it is believed that the concept of introducing a capitalistic leasing system in itself by a socialist country was not justifiable. As you well know, there are two forms of overseas leasing; one by establishing a joint company or a local corporation and another by leasing directly to users in foreign countries (including installment sales), but a movement of the former form to the communist bloc countries at present is very difficult.

With the exception of the Century Greyhound Leasing, an overseas branch of Century Leasing, which occupies 90 percent of the foreign leasing, there are only two lease companies (Orient Lease and Japan Lease) which have a double digit share in the market. As a whole, others have just reached the stage of internationalization. Lease items vary, but in terms of money, the leasing of ships in Hong Kong has the lead.

Use of Difference in Rate of Interest between Japan and United States

Since last year, the "yen-base lease" has become very active utilzing the difference in the rate of interest between yen and the U.S. dollar. The leading case is the finance lease of large aircraft since 1978 represented by the Flying Tigers (supervisory firm, Marubeni), Cathay Airlines (Tokyo Lease), Quantas Airlines (Orient Lease), Air France (Japan Lease), China Airlines (Marubeni) and Ale Hawaii Airlines [phonetic] (Marubeni).

In addition, large yen-base international leasing is represented by the contracts for oil drilling facilities at $47 million in the United States by 6 lease companies with Japan Lease as a supervisory firm. In the United States, yen-base leasing has become more promising to reduce the cost of financing. As a result, yen-base leasing of various large facilities and equipment beside the aircraft have increased.

Japanese lease companies such as the Orient Lease feel that "only countries with a yen creidt are able to carry out business in the yen-base leasing; therefore, limiting the number of countries with which to deal with; and because of the low interest rate in leasing, the number of acutal contracts is small in relation to the number of inquiries." But "they are willing to tackle it positively if the lease fee and credit are agreeable." The Sogo Lease company shows a forward looking posture through "taking a positive action by forming a syndicate group with various companies to cope with the approaches (inquiries) such as that made through the Merchants Bank of the United States."

Only negotiations in 10 billion yen units as in the case of the aircraft leasing are taken seriously, but on the other hand, volumes are also attractive. The excessive competition of "prospering without profit" from the dumping practice is being remedied and the creation of an environment of uniform fees have stimulated the industry toward a large-scale international leasing.

Avoidance of Country Risk

However, there are still many problems in the overseas advancement of leasing. The great problem is the "country risk." Political issues and economic environment from the Iranian problem, Soviet invasion of Afghanistan, upheaval in South Korea, worldwide recession and trade frictions have become more fluid to create a higher degree of tension. "Problem countries" and problem companies are on the increase and naturally easy credit in these situations can be fatal. A selection of partners for joint companies is also not easy. In recent years, practically all developing countries have

requested a joint venture form of lease companies and they often want Japan to provide the know-how and financing.

On the one hand, formation of a local firm with a 100 percent financing by a Japanese company requires time and money for credit check and negotiations with various government agencies and users. In a joint company, its partner can handle part of the duties, but in a 100 percent capitalization, a research on each country's peculiar social and economic sturctures and a study on the credit system must be made.

Moreover, the problem of the foreign exchange law can be pointed out. In a case where Japanese products are to be leased to a foreign country, the foreign firm will be required to include a purchase option at the termination of a lease contract. This type of a deal is not recognized in Japan as a lease but as an installment sale (deferred payment). Therefore, this type requires an approval of the Ministry of International Trade and Industry and the standards must follow the codes of the OECD, but the lease transactions do not conform to these standards. It means that the Japanese products produced in Japan cannot be leased directly to foreign countries. The foreign exchange law has put a damper on competing with the foreign lease companies and also on the move toward internationalization. Some form of corrective measures by the government is desirable.

While faced with these problems, the lease industry is concentrating on internationalization. For example, Japan Lease came up with its own rating of country risks by studying various countries' political stability, debt payment capability, currency stability, reliability, resource energy, inflation, etc., to determine each country's political, economic and social stability. Companies affiliated with banks and corporations are maintaining closer relationship with their parent establishments to collect and analyze information.

However, it is not easy to predict an abrupt political and economic upheaval such as seen in Afghanistan and Iran, and the oil shock. How to cope with a country risk will be the great focal point in the internationalization program.

Rise and Fall Depends on Human Resources

The greatest issue in the promotion of internationalization of leasing is in nurturing human resources. Generally speaking, the lease companies expanded in a relatively short time; therefore, personnel preparation has not been perfect, especially in the internationalization field. For this reason, medium rank personnel who have been with the company for 3-4 years are being trained for overseas assignments. The aim is not only on business capability but to improve their specialized knowledge, broad information processing and international sensitivity.

Japan Lease has been conducting overseas study trips since 1971-72 and from April 1980, one or two people with over 4 years with the company have been assigned overseas mainly in the United States. In addition, others as well

are given in-house training, external training and a self-development aid program for "morale boosting and cultivation of sense of independence and responsibility on the principle of the right job for the right person."

The external training is training through use of outside facilities for specialized subjects required in various departments. Personnel are not restricted to seminars but are also sent to observation and study sessions sponsored by financial and securities organs. The self-development aid program includes "13 courses on communication study aid" and "6 courses on qualification aid." Those who complete and qualify are reimbursed for the courses.

Orient Lease has established an "overseas dispatch system" to send trainees to its cooperating firm called U.S. Leasing for a 3-6 month study period.

Aside from these two companies, other companies which had very little organizational training are pushing for a full-sclae overseas advancement, but the rise and fall of these lease companies will depend on the quality of their human resources.

9218
CSO: 4105/044

DAIDO TO DEVELOP TITANIUM TECHNOLOGY WITH U.S. FIRM

Tokyo JPE AVIATION REPORT-WEEKLY in English No 599, 1 Dec 82 p 5

[Text] Daido Steel Co. has agreed with United Technologies Research Center to jointly develop practical scrap titanium recycling technology using the Daido-devised PPC furnace next year.

The joint technology development deal surfaced when Daido's senior managing director Tatsuo Fujiwara met with leaders of United Technologies Pratt & Whitney Aircraft Group (P&W) in the United States in mid-October. The agreement came after Richard C. Mulready, P&W vice president for technology, visited Daido's research institute equipped with a demonstration PPC furnace in mid-November.

United Technologies intends to purchase the new practical technology, if developed, for P&W's aero engine production, while Daido expects to start full-scale launch into overseas titanium markets with the joint program.

The PPC furnace will be used for initial melting of scrap titanium. The scrap will be melted again at the VAR furnace before being rolled and forged to become pure titanium product.

Daido completed the demonstration PPC furnace with the world's highest annual capacity of 700 tons at its Hoshizaki Research Institute last August. It has recently turned out a pure titanium product with the PPC furnace successfully.

Under the joint program, Daido will fabricate practical PPC furnaces in consideration of United Technologies Research Center's requirements and study whether the PPC furnace could be actually used for P&W's aero engine production.

After the research work lasting until next summer, Daido will export large PPC furnaces with the annual capacity of more than 1,500 tons each and operation know-how to P&W possibly by the end of 1983.

CSO: 4300/015

SEVENTEEN FIRMS TO DEVELOP 12 SYSTEMS FOR Y-XX

Tokyo JPE AVIATION REPORT-WEEKLY in English No 599, 1 Dec 82 pp 3-4

[Text] The Ministry of International Trade and Industry (MITI) has tentatively selected 17 companies for the development of 12 possible items for a planned 150-seat commercial aircraft, coded here as the Y-XX.

MITI hopes that manufacturers of avionics and other aircraft components as well as airframe and engine makers will take part in the joint Y-XX development program with foreign partners now under selection. Airframe manufacturers participating in the Y-XX program are expected to include Mitsubishi Heavy Industries Ltd. (MHI), Kawasaki Heavy Industries Ltd. (KHI) and Fuji Heavy Industries Ltd. (FHI), while a new engine, which will be developed jointly by seven firms of five countries including Japan's MHI, KHI and Ishikawajima-Harima Heavy Industries Co., is expected to be adopted for the Y-XX.

As of last July 20, MITI received proposals from 16 companies for 21 items for the Y-XX. The 12 selected items for the development are all new technology products which could certainly be adopted for the Y-XX.

The 12 selected items and the 17 firms, which are expected to sign contracts with Civil Transport Development Corp. for the development, are as follows:

1. Variable speed constant frequency: Shinko Electric Co.

2. Direct drive electric hydraulic servo valve: Teijin Seiki Co.

3. Highly reliable digital air data computer: Tokyo Aircraft Instrument Co.

4. Optical data link: Toshiba Corp.

5. Digital fuel gauge oscillator: Hokushin Electric Works, Ltd.

6. New display using touching sensors: Nippon Electric Co., MHI and Japan Air Lines (JAL)

7. Lightweight passenger seat: JAL, Koito Mfg. Co. and Toray Industries, Inc.

8. Electric actuation system: Japan Aviation Electronics Industry Co.

9. Lightweight lavatory module, lavatory assembly and air chiller: New Japan Aircraft Maintenance Co.

10. Composite-material gear parts: Sumitomo Precision Products Co.

11. Ceramic air cycle machine for environmental control: Shimadzu Corp. and Kyocera Corp.

12. Integrated display: Mitsubishi Electric Corp.

Of the 17 firms, participants in the Boeing 767 (Y-X) Program are Teijin Seiki, Tokyo Aircraft Instrument, MHI, Koito, New Japan Aircraft Maintenance, Sumitomo Precision, Shimadzu and Mitsubishi Electric.

CSO: 4300/015

MHI DEVELOPS THIRD-STAGE ENGINE FOR H-1

Tokyo JPE AVIATION REPORT-WEEKLY in English No 595, 3 Nov 82 pp 8-9

[Text] Mitsubishi Heavy Industries Ltd. (MHI) has developed a rocket engine fueled by liquid hydrogen and oxygen for the third stage of the H-1 rocket now under development by the firm.

The government's Space Activities Commission has designed only the second-stage engine of the H-1 to use liquid hydrogen and oxygen. But MHI has deviced the liquid hydrogen and oxygen engine for the third stage as well to cope with possible modifications in the H-1 design which are being considered by the commission.

The H-1 is designed to launch a 550-kilogram geostationary satellite. But the United States and western Europe have completed rockets for lifting more-than-one-ton satellites, prompting Japanese users of the H-1, including the Nippon Telegraph and Telephone Public Corporation, to express dissatisfaction with the H-1's capability. Thus the commission is considering modifications in the H-1 to increase its capability.

The third-stage engine developed by MHI is estimated to generate a thrust of 900 kilograms. If this engine is used for the H-1 along with the LE-5, a liquid hydrogen and oxygen engine for the second stage, the rocket would become capable of putting an 800-kilogram satellite into a geostationary orbit.

MHI estimates the H-1 to be capable of launching even a two-ton satellite if its three engines are all fueled by liquid hydrogen and oxygen.

The company conducted combustion tests of the third-stage engine at Tashiro Rocket Test Ground in Akita Prefecture since last January, confirming the engine is more powerful than the LE-5 second-stage engine. Test combustion lasted for a total of 268 seconds.

MHI is also considering using a liquid hydrogen and oxygen engine for the first stage as well. It has already tested a liquid hydrogen pump for the engine.

MITSUBISHI GROUP PROPOSES ROLE IN U.S. SPACE PROGRAM

The Mitsubishi group, leading Japan's aerospace industry, has made a specific proposal to the Space Activities Commission and other government agencies for Japan's participation in the U.S. National Aeronautics and Space Administration's (NASA) space station program.

Mitsubishi Corp., Mitsubishi Heavy Industries Ltd. and Mitsubishi Electric Corp. in the proposal said the Japanese should undertake development of a manned space laboratory in the space station, an unmanned bus platform separated from it and a manned space cab shuttling between them to take part in the NASA program, including the initial planning phase.

Although the development costs Japan ¥600,000 million, Japan's financial, technical and manufacturing participation in the U.S. program would better Japan-U.S. relations and contribute to promoting its aerospace industry, the Mitsubishi group said.

Japan could absorb advanced U.S. space technologies through the program and have its own space laboratories, paving the way for its own future space utilization, it said.

The Mitsubishi proposal is expected to have a great influence on the Japanese government and overall industry.

NASA has designed the space station as a plant to turn out new materials and drugs for transport with space shuttles to the earth. It plans to develop equipment from 1985 and launch the station in 1989 at a cost between ¥1 trillion and ¥2 trillion.

NASA has already called on European nations, Canada and Japan to participate in the program starting from the initial stage of planning.

The Japanese government conveyed its intention of meeting the request through Director-General Ichiro Nakagawa of the Science and Technology Agency to NASA when he visited the United States last June. The Space Activities Commission has recently set up a special committee to consider Japan's participation in the U.S. space station program.

The committee will work out a Japanese proposal for the program by March 1983 on the basis of the Mitsubishi group proposal and other ideas presented at a space station symposium on Oct. 21. The Japanese proposal will be presented to NASA.

Space station equipment proposed by Japanese companies other than the Mitsubishi group included a space tug by Nissan Motor Co., an electric propulsion system by Ishikawajima-Harima Heavy Industries Co. and a geostationary transmission satellite.

CSO: 4300/010

NATION TO DEVELOP 1.5-TON-THRUST ROCKET

Tokyo JPE AVIATION REPORT-WEEKLY in English No 597, 17 Nov 82 pp 8-9

[Text] The Science and Technology Agency is considering the development of a large 1.5-ton-thrust rocket, starting in 1984, because the Nippon Telegraph and Telephone Public Corporation and other satellite users have urged larger launch vehicles to be developed for larger applications satellites as early as possible.

The agency has originally planned to develop the 800-kilogram-thrust H-1B rocket after the 550-kilogram-thrust H-1A. But it is now planning to increase the H-1B's thrust sharply to around 1.5 tons.

The new rocket development plan will be proposed to the Space Activities Commission for approval next spring. If it is authorized, Japan could develop the large rocket by the early 1990s.

The new plan has been prompted not only by the satellite users' request but by foreign industrialized nations' advanced rocket development efforts, which are expected to turn out launch vehicles for two-ton-plus satellites in several years. The United States plans to fire a 2.2-ton-thrust launch vehicle in January, while West Europe intends to realize a 2.1-ton-thrust rocket as the fourth-generation Ariane.

The H-1A rocket under development is designed to have a kerosene-burning first stage and a second stage fueled by liquid oxygen and hydrogen. The Science and Technology Agency and the National Space Development Agency (NASDA) have been considering two ways to develop the H-1A into the 1.5-ton-thrust H-1B.

The first way is to develop a new first-stage booster burning liquid oxygen and hydrogen in place of the kerosene-fueled model. The second is to replace the first stage with

a combination of two to three first-stage boosters for the already-developed N rocket.

The second way would be easier. In this case, however, it would be difficult to increase the rocket's thrust beyond 1.5 tons in the future.

The first way, though taking more time than the second, is expected to be adopted to pave the way for boosting the thrust to more than two tons in the future.

Mitsubishi Heavy Industries Ltd., which has undertaken the H-1A development program, is reportedly confident of developing a liquid oxygen and hydrogen first-stage booster because its development of the second-stage booster for the H-1A has made smooth headway.

CSO: 4300/010

FURUKAWA ELECTRIC DEVELOPS SUPER-LARGE, THIN SUPERCONDUCTING ELECTROMAGNET

Tokyo KINZOKU JIHYO in Japanese 13 Sep 82 pp 421-423

[Text] Furukawa Electric Company recently received an order exceeding 600 million yen from the High Energy Physics Laboratory [HEPL] of the Ministry of Education for a superconducting magnet that is super-large and thin. Many manufacturers bid for the magnet, but Furukawa was chosen after stringent technical evaluations.

The superconducting magnet will be installed as a part of the Tristan Project, which is under construction at HEPL. The magnet will be used in an experiment for head-on collisions of 30 GeV [giga electron volts] electrons and positrons. In the first phase of the Tristan Project (an expansion plan for HEPL), an electron-positron storage ring of about 960 meters in diameter will be built in the laboratory and then an experiment will be conducted on the collision of 30 GeV electrons and positrons. In the second phase, a new, superconducting storage ring for protons that is the same size will be added to carry out experiments on the collision of 30 GeV electrons and 300 GeV protons.

Particles emerging from such collisions will be detected both inside and outside the electromagnets, and the particles' momenta and energies will be analyzed. For this purpose, the electromagnets must be super-large, very thin, and they must use materials that absorb few high energy particles. Hence, aluminum is used as the main material, which imposes strict design requirements that have not been considered before in conventional superconducting magnets.

The superconducting wire to be used in the magnet uses, as its base material, a conventional superconducting wire composed of Nb-Ti alloy and Cu. As the stabilizer, a large quantity of high-purity Al is wrapped around the wire which covers and is fused onto the wire metallurgically by pushing it out while the metal is still hot. This superconducting wire is a modern type, which will be used for the first time on such experimental equipment.

Through the operation of the entire detector apparatus (known as TOPAZ) which includes the electromagnets, the apparatus is expected to lead the world to the discovery of elementary particles such as the top quark and Z particle. Quarks are believed to be the smallest constituents of matter. In this respect, the HEPL project has become the focus of world attention.

The fabrication of the superconducting magnet ordered by HEPL is considered to be a difficult task. To reduce the total amount of material used, the cryostat (heat-insulated container) that contains superconducting coils will be made entirely of an Al alloy. The magnet is so thin that difficulties in handling and fabrication are expected. The Al alloy to be used is the high-strength A2219 alloy, which is difficult to weld. It will be the first time in Japan the alloy will be used for a vacuum vessel.

The high-strength Al alloy, A2219, was standardized first in the United States, but no JIS standard exists yet for the alloy. It has excellent strength; it contains 5.8 to 6.8 percent of Cu, 0.2 to 0.4 percent of Mn, 0.02 to 0.10 percent of Ti, 0.10 to 0.25 percent of Zr, and 0.05 to 0.15 percent of V. Because of its high strength, the alloy has recently been used in airplanes and rockets, but welding is extremely difficult, as is in the case of duralumin.

For these reasons, Furukawa Electric states that it will fabricate the magnets in cooperation with Fuji Electric Company and Ishikawajima-Harima Heavy Industries Company. The delivery of the magnets is scheduled for March 1984.

In the fabrication of the superconducting wire, Furukawa Electric will use the compound push-out technique, which has been developed by the company after an extended research period. Through the research and development that have been conducted so far, the feasibility of manufacturing a uniform superconducting wire material about 1 foot long has been verified. The problem of establishing an inspection method for the entire length of the superconducting wire has also been solved.

On the other hand, new ideas are used in the manufacturing of coils using Al-stabilized superconducting wire. In general, when a superconducting coil is energized, the generated electromagnetic force is pointed outward in the radial direction. Usually the coil wire is wound around a bobbin, and support for the electromagnetic force is built outside the coil. The bobbin is needed to wind the wire, but it will not serve as a support for the electromagnetic force.

In contrast, the new magnet uses an outer cylinder (cylinder to support the electromagnetic force) made of the high-strength Al alloy, A2219, to reduce the material in the radial direction as much as possible. The coil will be wound inside the cylinder directly, without any bobbin. In order to develop this winding technique, a test fabrication has already been carried out in which superconducting wires, stabilized by high-purity Al, was wound inside an actual-size outer cylinder.

The specifications and the structure of the magnet are shown below. The use of this type of magnet is being planned in several other foreign countries, and it is expected that several magnets will be built within a few years. Furukawa Electric has already received inquiries from Europe and the United States.

Specifications for the Super-Large, Thin, Superconducting Magnet

Aluminum-Stabilized Superconducting Wire

Size	About 3.6 mm x 20.0 mm
Cross section ratio	Nb-Ti : Cu : Al = 1 : 1 : 24
Required length	12,200 m

Superconducting Magnets

Size	2,740 mm ID - 3,220 mm OD x 5,400 mm L (vacuum vessel) 2,880 mm ID - 2,920 mm OD x 5,100 mm L (coil)
Coil winding method	Single-layer solenoid by edgewise winding
Coil cooling method	Indirect cooling by double-phase flow [liquid] helium
Insulation method	Vacuum insulation with liquid nitrogen shields containing multi-layer insulators
Magnetic field at the center	1.2 teslas
Rated current	3,600 amperes
Inductance	3 henrys
Stored energy	19 megajoules

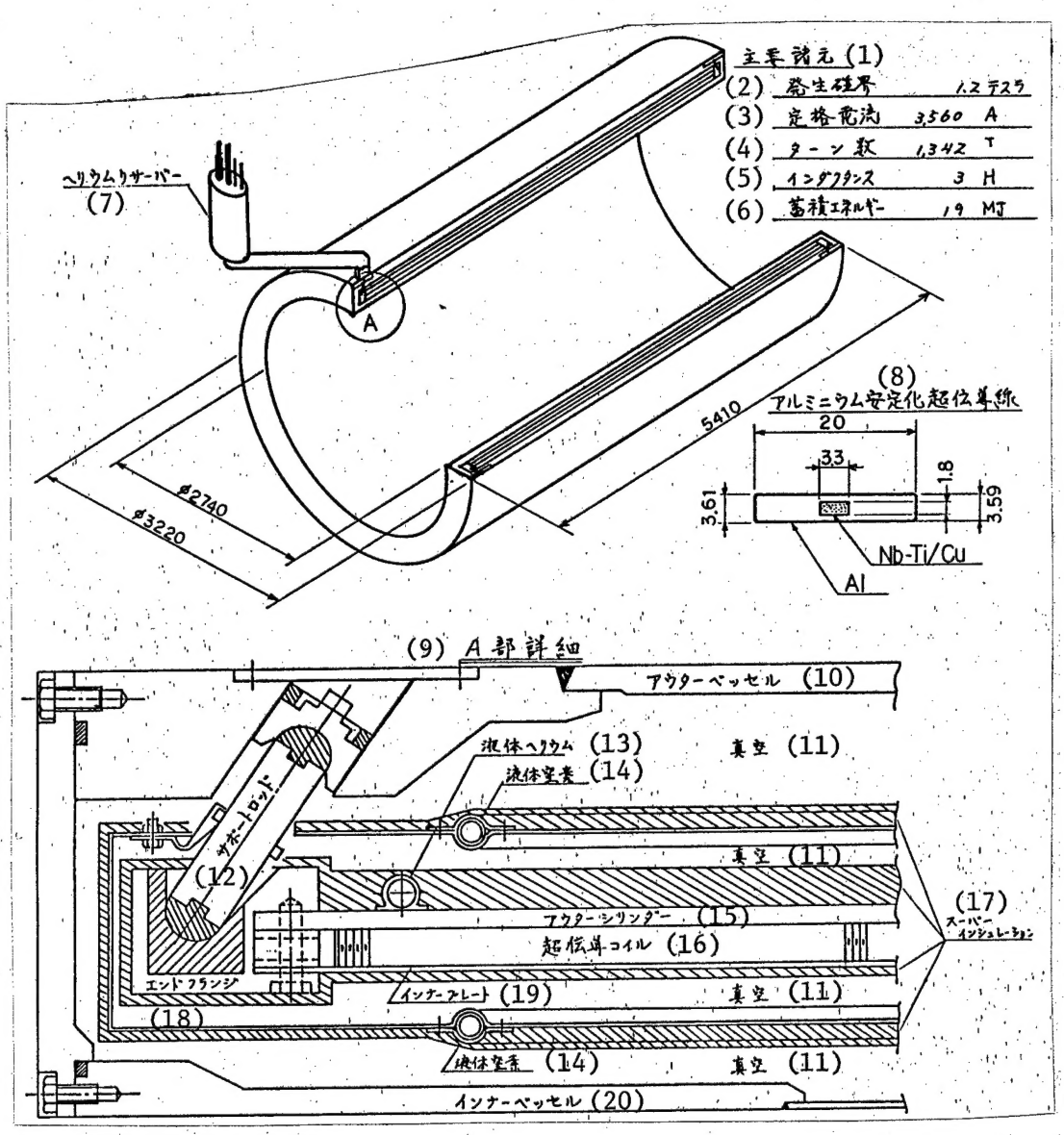

Illustration of the thin superconducting soil to be used in a detector for electron-positron collision reaction particles

Key:
1. Principal data
2. Generated magnetic field: 1.2 teslas
3. Rated current: 3,560 amperes
4. Turns: 1,342 turns
5. Inductance: 3 henrys
6. Stored energy: 19 megajoules
7. Helium reservoir
8. Aluminum-stabilized superconducting wire
9. Details of cross section A
10. Outer vessel
11. Vacuum
12. Support rod
13. Liquid helium
14. Liquid nitrogen
15. Outer cylinder
16. Superconducting coil
17. Super-insulation
18. End flange
19. Inner plate
20. Inner vessel

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CSO: 4306/036

END